DOCUMENT RESUME

ED 406 966 IR 018 314

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TITLE	Facilitator and Student Roles and Performance in a High School Distance Education Course.
PUB DATE	Mar 97
NOTE	28p.; Paper presented at the Annual Meeting of the American Education Research Association (Chicago, IL, March 27, 1997).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Academic Achievement; Case Studies; Communications Satellites; *Distance Education; *Educational Technology; High Schools; Instructional Effectiveness; Nontraditional Education; Outcomes of Education; Physics; School Role; Science Instruction; *Student Role; *Teacher Role; Teaching Methods; Telecommunications; Theory Practice Relationship
IDENTIFIERS	*Facilitators

ABSTRACT

This study focused on the roles facilitators and students play in high school distance education classes, how these roles affect student performance, and other factors (such as school organization) which affect facilitator and student performance. Three classrooms from three different high schools, each taking the same nationally-offered distance education physics course during the 1994-95 school year, participated. The course was delivered live, twice a day, via satellite, with telephones and a computer keypad system connecting the students with the remote teacher. The research methodology included classroom observation, interviews with classroom facilitators and students, and review and analysis of student work, extant documents, and resources used in the course. Results supported the position of theorists who contend that distance education does not constitute a distinct educational process. The same factors that affect student learning in a traditional classroom (learner skills, knowledge, beliefs, and attitudes, and course and lesson design) also affect student learning in a distance education class. The study also suggests that responsibility for the quality and outcome of distance education courses is shared among all components of the distance education system. Specifically, the course provider, instructor, and designers are responsible for providing effective, efficient instruction that maximizes student achievement. The responsibilities of the local school include ensuring that students possess pre-requisite entry skills and supporting utilization of the course as designed. In addition to course design and school factors, facilitator roles and performance requirements are defined by the needs of the students themselves. (Contains 36 references.) (AEF)

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Facilitator and Student Roles and Performance in a High School Distance Education Course

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Facilitator and Student Roles and Performance in a High School Distance Education Course

This study was initially designed to identify the roles of classroom facilitators and students within the context of a high school distance education course and to examine how those roles affected student performance. However, it quickly became apparent that the school played an important part in facilitator and student behavior. Consequently, the focus broadened to reflect a realm of variables, including school attributes, that influenced distance education in this setting. The research questions included: a) What roles do facilitators and students play in high school distance education classes? b) How do these roles affect student performance? and c) What other factors (such as school organization) affect facilitator/student performance?

In addition, the distance education system was analyzed from an instructional systems perspective. The interdependence of the system components, including the course provider, instructor/designer, participating school, local facilitator, and students were examined at macro (course design) and micro (lesson design and utilization) levels.

Theoretical Framework

Distance education, when defined as an educational transaction between a teacher at one geographic location and a learner at another, dates back to late nineteenth century correspondence courses. Today, distance education encompasses a myriad of delivery systems that provide learning opportunities to students of all ages. However, Moore (1993) characterizes contemporary distance education as "chaotic and confused" and recommends the use of a systems approach to design and organize instructional resources to maximize efficiency and effectiveness.

A system is defined as a group of interrelated elements or components that work together to accomplish a common goal (Gustafson & Tillman, 1991). Banathy (1992) specifies that human activity systems are groups of people and resources working together as a whole to achieve a given purpose. Dick and Carey (1990) indicate that an instructional system is one where the components work toward the goal of successful learning. Distance education is both a human activity system and an instructional system. The human components include administrators, instructional designers, technology experts, teachers, facilitators, students and other support personnel who work within subsuming organizational systems such as schools and course providers (Thach, Korhonen, & Murphy, 1994). Resources encompass a variety of technological media and tools. These components work toward the common goal of successful student learning. Applying the concepts of system theory, one can deduce that these components are interrelated and have an effect on each other, the system, and the system outcomes. Ideally, the components will work together to maximize system effectiveness and efficiency.

During the past decade, American high schools began using distance education technologies to offer students advanced courses in math, science, and foreign languages. These courses often use a teacher-facilitator-student model where the teacher is at a remote site and the facilitator and students are in a local classroom (Tushnet, 1994, Withrow, 1989). Teachers and students have always been major components in educational systems, and their roles have been well defined and documented. However, the classroom facilitator represents a new component. Little is known about roles classroom facilitators play in distance education, how they affect other components in the system, or how they affect system outcomes (Willis, 1992).

Many believe the presence of a classroom facilitator offers an opportunity to enhance learning for students in the remote classroom (Willis, 1992). The importance of the facilitator has been cited frequently, and numerous roles have been proposed for them (Moore, 1989; U.S. Congress, 1989; Willis,1991; Yi & Majima, 1993). Schlosser and Anderson (1994) indicate that the facilitator operates equipment, distributes instructional materials, answers questions, offers encouragement to students and assists the remote teacher. Bradshaw and Brown (1989) noted that most successful projects place a trained aide at the receiving site with students to operate equipment, evaluate homework, and monitor testing and behavior. Bond (1987) reported that site

facilitators are generally required to provide supervision during the class period and to manage instruction locally, with responsibilities that include motivating students, monitoring student progress, distributing materials, collecting homework, and proctoring tests. Wagner (1993) suggested that facilitators "keep faculty aware of student perspectives, manage the distance environment to maximize learning effectiveness, and troubleshoot equipment" (p. 31). It should be noted that most of this information is anecdotal, not the result of formal inquiry.

Little formal research has been conducted on the roles facilitators play or the impact they have in distance education classrooms. Thach, Korhonen, and Murphy (1994) conducted a modified two-round Delphi study with distance education experts from the U.S. and Canada to identify distance education roles, outputs, and competencies. The functions they identified for site facilitators included serving as a liaison between the distance learning provider and the receive site, making sure the remote site was ready and the equipment was operational, helping students learn at remote sites, passing out and collecting materials, and proctoring tests and exams. While these results echoed the anecdotal literature, all respondents were from universities or colleges. Thus, these results may not be an accurate reflection of K-12 distance education settings.

Payne (1989) conducted a Delphi study with 25 high school facilitators and 25 high school administrators and found that knowledge of the subject matter and positive attitude/enthusiasm were ranked as the most important facilitator skills. Libler (1991) compared student achievement in high school Physics interactive television courses with and without certified science teacher facilitators and found no significant difference. Moore, Burton, and Dodl (1991) conducted an evaluation of the Virginia Electronic Classroom program for the Virginia Department of Education and concurred with much of the anecdotal literature about facilitator roles in distance education. However, findings in all these studies were based primarily on interview and self-report data, with minimal observation of what actually occurred in the classroom.

Yi and Majima (1993) observed a satellite-delivered high school Japanese class to examine the relationship between teachers and learners in distance education. They found that the primary facilitator role was mediating between the remote teacher and the learner, however, they did not address how the facilitator affected student performance. Russell (1991) conducted a study to examine the relationship between facilitator practices and student performance using a knowledge test and self-report inventory to reflect facilitator practice and student semester grades to indicate student performance. The data analysis revealed no significant relationship between student achievement and facilitator practice. However, Russell acknowledged a number of potential problems with the study and suggested that a statistical test may not be adequate to reveal a relationship between facilitator attributes and student achievement.

Design of the Study

As distance education systems grow more complex and contextually divergent, the importance of conducting research within these environments also increases (Burge, 1990; Kember et al., 1990). Driscoll (1989) suggests that research should examine learning in context using a holistic approach that is sensitive to the complexity of the learning environment. Many believe that naturalistic research methodologies are the most appropriate for holistic, systemic inquiry (Lincoln & Guba, 1985; Owens, 1982), and increasing numbers of distance education researchers suggest non-experimental methodologies for studies in this area (Burge, 1990; Garland, 1993; Kember et al., 1990; Morgan, 1991; Russell, 1991).

A naturalistic, ethnographic, multiple case study research design was used for this study. Three classrooms from different high schools (South High, Central High, and North High; all fictitious names), each taking the same nationally-offered distance education physics course during the 1994-1995 school year, participated. The course was delivered live, twice a day (8:30 am and 2:30 pm EST), via satellite. Telephones and a computer keypad system connected the students

with the remote teacher. The course design included 30 minutes of instruction and other activities provided by the satellite teacher, as well as a 20 minute off-air period during which the facilitator and students did homework, discussed problems, or did labs.

The research methodology included extensive classroom observation, informal and formal interviews with classroom facilitators and students, and review and analysis of student work products, extant documents and resources used in the course. Each participating physics class was observed daily, in its entirety, for two consecutive units of study. A third unit of study was observed later. The researcher was in each classroom for an average of nine weeks. During each class, the researcher focused on student and facilitator behavior and performance and maintained a set of field notes and observations. In addition, each session was audiotaped to supplement the researcher's field notes. Informal interviews and conversations were conducted with students and teachers during the initial observations, and formal interviews were conducted with all participants during the final observation period. Formal interview protocols for students and facilitators were developed based on the observations and preliminary findings from the initial observation period.

An inductive constant comparative method was used to analyze the data. Collected data was transcribed, compiled, and coded; and then compared and contrasted to identify patterns and trends. Triangulation of data collection methods and data sources was used to enhance reliability and validity. Descriptive findings and interpretive conclusions were reported.

Data Sources and Evidence

A purposive sampling strategy designed to provide maximum variation, particularly in regard to the facilitators, was used to select the participants. Willis (1992) and others have suggested that elementary, middle, and high school facilitators can be grouped into three categories according to their education and expertise. The first facilitator category includes teachers who are certified in the general subject area (math), but may or may not have specific topic expertise (calculus). Facilitators who are certified teachers, but are certified outside the subject area (a certified math teacher facilitating a foreign language class) make up the second facilitator category. Facilitators in the third category are not certified teachers and may be paraprofessionals, teacher aides, or others. The three cases for this study were selected so that all three facilitator categories were included. One facilitator was a certified parprofessional aide, one facilitator was a certified social studies teacher working as a school administrator, and the third was a certified science teacher who taught physical science but had no physics experience.

Other variations represented in the three cases included (a) number of years experience the facilitator had working with distance education classes; (b) class size; (c) student demographics (race and grade level); (d) match of the school bell schedule with the time the distance education course was offered; (e) number of distance education courses offered by the school; and (f) location of the school (two adjacent states, three different school districts). A comparison of the case variations is provided in Table 1. Pseudonyms have been used for the schools, facilitators, and students to protect their privacy.

Extant data sources included printed facilitator and student course materials; the Physics textbook; correspondence between the remote teacher and the facilitator; school-related information such as student handbooks, grading policies, and school profiles; the facilitator gradebook; and student work products including homework, lab reports and tests.

Physics Course Design and Facilitator Training

The Physics course included components that suggested a systematic planning approach had been used to design and develop the course. Students were provided performance objectives for the course at the beginning of the year, and the Physics Companion for each unit also included

performance objectives. Observation of the broadcast lessons, off-air labs, homework assignments, and review of course materials such as the instructor-developed Physics Companion, suggested that the instructional activities were designed to directly support student attainment of the

Table 1
Description of Study Participants

School	South High	Central High	North High
Facilitator	Mrs. Grant	Mrs. Sanders	Mrs. Wilson
Facilitator Background	Certified social studies teacher working as school administrator, 3rd year as Physics facilitator	Certified science teacher teaching 9th grade physical science, 2nd year as Physics facilitator	Certified paraprofessional aide working as full-time facilitator for 5 distance ed courses, 5th year as Physics facilitator
Physics Class (Demographics)	6 students •all seniors •3 Black females, 1 White female, 2 Black males	11 students •all seniors •7 White females, 4 White males	11 students •3 seniors, 8 juniors •3 Black females, 3 White females, 5 White males
School Bell Schedule vs. Physics Class Time	School Schedule: •1:20 - 2:10 pm Physics Schedule: •1:30 - 2:20 pm	School Schedule: •1:25 - 2:15 pm Physics Schedule: •1:30 - 2:20 pm	School Schedule: •8:20 - 9:10 am Physics Schedule: •8:30 - 9:20 am
School Distance Education Experience	•3rd year of Physics •No other distance ed courses	•2nd year of Physics •Also offering Latin I (1st time)	•5th year of Physics •Also offering Calculus, Japanese, German I & II for 5 years
School Location	•Southern State A •Rural area serving small town in which it was located •County population 42,000 with 3 other high schools in county	•Southern State B •Rural area serving entire county •County population 10,500 with no other high school in county	•Southern State B •Rural area serving entire county •County population 9,200 with no other high school in county
School Demographics	•372 students •Grades 9-12 •41% pursue post-secondary education	•610 students •Grades 9-12 •60% pursue post-secondary education	•502 students •Grades 9-12 •60% pursue post-secondary education

course and unit objectives. Examination of quizzes and unit tests revealed that test items matched unit objectives. Thus the correspondence between the objectives, instructional activities, and assessments followed the pattern established by systematic planning models (Dick & Reiser, 1989).

All three facilitators had worked with the Physics course for one or more years prior to the 1994-1995 school year, but none of them had been provided with formal facilitator training for the Physics course. All had viewed the facilitator training tape the first year they worked as a facilitator, but no one had viewed it since. However, it should be noted that the training tape was limited to the operation of the interactive keypad equipment and software; it did not address other tasks to be performed. A facilitators guide that outlined facilitator responsibilities in terms of homework, test administration and grading, entering grades in the computer, and other basic classroom activities was also provided. The facilitators indicated that they scanned the guide, but since it was similar to previous guides they did not re-read it in depth. All three facilitators indicated that they relied primarily on their previous year or more of experience as facilitators to guide them through the 1994-1995 Physics class. Thus, while the three facilitators had differing educational backgrounds (certified in science, certified but not in science, and paraprofessional), they had similar backgrounds in regard to distance education facilitator training.

Descriptive Findings

The descriptive findings address each of the three components (facilitators, students, and schools) examined in the study. For brevity, these have been summarized into comparison tables by school. Table 2 highlights facilitator characteristics and roles. Facilitator roles have been divided into four categories traditionally associated with teaching: planning, instruction, management and climate (Allen, 1991). Table 3 presents student characteristics and behaviors, and Table 4 synopsizes school characteristics. Table 5 provides student performance as measured by final course grades for each student by school.

Discussion and Conclusions

Distance education models have traditionally been discussed in terms of a student or students, a teacher, the instructional materials, and a delivery system (Dewal, 1988; Keegan, 1990). Conceptually, this model can be illustrated as the first three components interconnected by the fourth (see Figure 1).

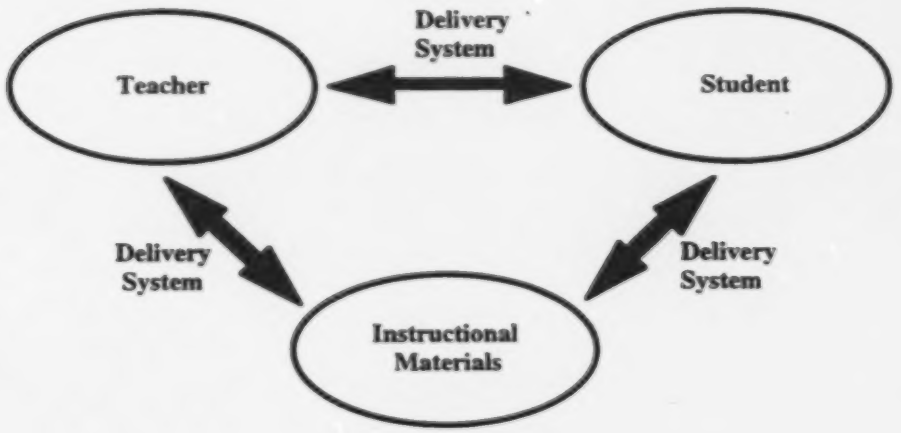

Figure 1. Traditional Distance Education Model

Table 2
Facilitator Characteristics and Roles

South High School	Central High School	North High School
•Mrs. Grant, School administrator •Social Studies Certification, 19 yrs experience •3rd Year as Physics Facilitator •Many non-class responsibilities during Physics •Frequently absent during class	•Mrs. Sanders, 9th grade Physical Science Teacher •Science Certification, 23 yrs experience •2nd Year as Physics Facilitator •No non-class responsibilities during Physics •Always in classroom during class	•Mrs. Wilson, Full-time facilitator •Paraprofessional, 10 years as substitute teacher •5th Year as Physics Facilitator •Responsible for German class during Physics off-air •Usually in classroom during on-air Physics class
PLANNING ROLES: •Duplicate, distribute materials; set up labs •Schedule make up classes for school holidays or scheduling changes •Pull students from other classes to do missed sessions	PLANNING ROLES: •Duplicate, distribute materials; set up labs •Make tapes available to students to make up missed classes	PLANNING ROLES: •Duplicate, distribute materials; set up labs •Make tapes available to students to make up missed classes
INSTRUCTIONAL ROLES: •Gain & keep student attention on Physics teacher •Elicit participation •Occasionally review/recall Algebra concepts •Encourage students to call tutors or ask math teacher for help •Coach/guide students through labs •Grade & record homework, labs, tests & provide feedback from answer key Monitor tests •Establish retake policy for tests for extra credit	INSTRUCTIONAL ROLES: •Clarify classroom procedures & repeat instructions as required •Occasionally encouraged review/recall of prior Science concepts •Occasionally clarified content questions •Clarify lab procedures •Record grades, usually encouraged students to self-grade tests with answer key then double-checked •Implement tests as designed by instructor	INSTRUCTIONAL ROLES •Gain & keep student attention on Physics teacher •Elicit participation •Maintain homework log on blackboard •Encourage students to call tutors •Encourage peer tutoring within class •Coach/guide students through labs •Grade & record homework, labs, tests & provide feedback from answer key •Monitor tests and occasionally provide clues •Establish liberal homework policy (get credit for turning in at any time)
MANAGEMENT ROLES: •Keep students focused & on task •Encourage positive attitude toward Physics class •Personally participate & pay attention •Exhibit interest and concern for students	MANAGEMENT ROLES •Students required little management intervention •Demonstrated positive attitude toward course, instructor & students •Sat with students & paid attention	MANAGEMENT ROLES •Keeps students on task •Curtailed non-Physics related student conversations •Served as authority figure for problem resolution •Encourage positive attitude toward Physics class •Personally participate & pay attention •Exhibit interest and concern for students
SCHOOL CLIMATE ROLES: •Coordinate Physics students schedules with other teachers for early release as needed •Provide parents interim grade reports	SCHOOL CLIMATE ROLES •Provide parents interim grade reports	SCHOOL CLIMATE ROLES •Provide parents interim grade reports •Explain distance ed process to other teachers •Arrange for special scheduling with teachers •Talk to parents about student performance

Table 3
Student Characteristics and Behaviors

South High School	Central High School	North High School
•6 Seniors •Class rank ranged from top to middle •3.2 - 2.1 overall GPA range •Majority already passed Algebra II, but most felt math skills inadequate for Physics •Took Physics because preferred to Adv. Biology to meet graduation requirement & thought it would be "good" for them •Found it more difficult and more work than other classes •Most copied homework answers from back of book or from each other •Used educated guess approach to taking tests •Poor test study habits; minimal study time, ignored study guide and materials emphasized by instructor •Did not consistently make up missed classes •1 student called tutors •Relied on external locus of control to pay attention in class, do class work	•11 Seniors •Majority had high class rank (top 10%) •4.0 - 2.9 overall GPA range •All already passed Algebra II •Took Physics because curious about the content, distance ed delivery, & preferred to Adv. Biology to meet "Honors" requirement •Found it required more responsibility on their part, but same work load & difficulty as other classes •Most worked homework individually rather than copying answers •Worked test problems and showed work on tests •Good test study habits; regularly studied for test using study guide and materials emphasized by instructor •Made up missed classes on own initiative •1 student called tutors •Relied on internal locus of control to pay attention in class, do class work	•3 Seniors, 8 Juniors •Unknown class ranks (due to Jr. Standings) •3.7 - 2.0 overall GPA range •Only 4 already passed Algebra II •Took Physics to meet graduation requirement & heard it was easier than Chemistry •Found it more difficult but less work than other classes •Most copied homework answers from back of book or from each other •Used educated guess approach to taking tests •Mixed test study habits; various study time, some used study guide and materials emphasized by instructor, others didn't •Some made up missed classes using tape •Several students called tutors or teacher at facilitator's urging •Relied on external locus of control to pay attention in class, do class work

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Table 4
School Characteristics

South High School	Central High School	North High School
•Off-air period split before and after class into two 10-minute segments •Frequent class interruptions/dismissals during first 6 weeks of school for pep rallies, assemblies •Numerous school holidays not observed by Physics provider •Substitute never hired for facilitator absences, media specialist or other teacher might check on class •Students enrolled in "Court Procedures" course missed class every Weds. for one entire semester	•No split in off-air period •No class interruptions due to special activities •Few school holidays not observed by Physics provider •Substitute always hired for facilitator	•No split in off-air period, but students were required to go to media center for off-air part •Few class interruptions due to special activities •Numerous school holidays not observed by Physics provider •Substitute always hired for facilitator

Table 5
Student End of Year Grades By Activity

	ACTIVITY (Total Possible Points)					ACTIVITY (Total Possible Points)					ACTIVITY (Total Possible Points)			
South High	Tests (850)	Labs (1475)	Hw/Qz (2530)	Final Grade	Central High	Tests (950)	Labs (1775)	Hw/Qz (2615)	Final Grade	North High	Tests (950)	Labs (1700)	Hw/Qz (2490)	Final Grade
Reba	676	1289	2201	83%	Diana	957[a]	1742	2513	99%	Ruth	538[b]	1677	2365	81%
Cynthia	682	1290	2084	83%	Allison	955[a]	1747	2560	99%	Jeanette	426[b]	1662	1768[d]	71%
Marcus	623	1159	1601	73%	Wendy	906	1666	2530	95%	Marian	467[b]	1652	1530	72%
Edmund	648	1250	1989	79%	Beth	816	1711	2453	91%	Britt	654	1638	1848	80%
Seleta	563	1102	1728	69%	Marsha	811	1663	2516	90%	John	691	1450	1860	78%
Cathy	567	1215	1540	71%	Jerry	853	1729	2375	92%	Verna	551	1435	1678[e]	70%
					Walter	823	1690	2460	91%	Paul	531	1539	1538[f]	70%
					Helen	724	1658	2543	85%	Sarah	543	1670	1880	75%
					Miranda	716	1594	2399	83%	Jim	627	1518	1506	73%
					Lee	737	1623	2445	85%	Mac	570	1615	1745	74%
					Brent	711	1612	2140	81%	Linda	512	1471[c]	1620	70%
Mean	626.5	1217.5	1857	76%	Mean	819	1675	2448.5	90%	Mean	555.4	1575	1758	74%
% of possible	73.7%	82.5%	73.0%		% of possible	86.2%	94.4%	93.6%		% of possible	60.1%	93%	71.6%	

Source: Printout from Physics Computer Gradebook Program maintained at each school.

[a]Score is above 950 dues to extra credit points student earned on test bonus questions.

[b]Total possible test points for these students is 850. Since these students were seniors, they were out of school and did not take the last 100 pt exam.

[c]Total possible lab points for this student is 1600. Student was excused from doing a 100 point lab due to absence.

[d]Total possible homework points for this student is 2340. Student was excused from a 40 point daily quiz, a 60 point daily quiz and a 50 point daily quiz due to absence.

[e]Total possible homework points for this student is 2350. Student was excused from a 40 point daily quiz, an 80 point daily quiz and a 20 point homework assignment due to absence.

[f]Total possible homework points for this student is 2390. Student was excused from a 60 point daily quiz, and a 40 point daily quiz due to absence.

[g]Total possible homework points for this student is 2155. Student was excused from a 60 point daily quiz, a 30 point daily quiz, and several homework assignments totaling 265 points due to absence.

However, examination of facilitator and student roles and performance for distance education in a high school setting requires a different framework. For high school students, a distance education course may be only one course out of the five or six that comprise the student's daily course load. The components of the course in this study, from a student perspective, included the teacher, facilitator, resources (class broadcast, print materials, tutors, Homework Hotline), and the delivery system. But since the course was offered as part of the regular high school day, the student's experience with the distance education course was mediated by the constraints of the school itself. And, as with any learning experience, the prior skills and knowledge the student brought to the distance education course affected his performance outcome. Looking at a distance education course from the high school student's perspective suggests a model similar to that illustrated in Figure 2.

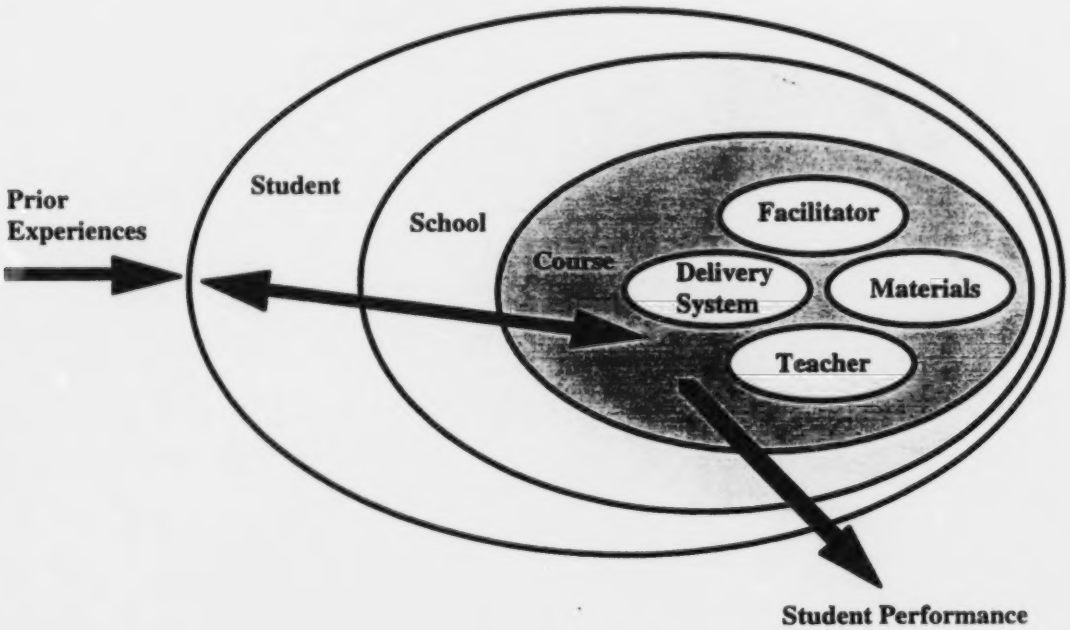

Figure 2. Framework for Examining Student Performance in High School Distance Education.

This framework is also useful for examining facilitator roles since the facilitator operates as one of the components within the Physics course, but is also affected by the school within which the distance education course is offered, and the affective, cognitive and behavioral traits the student brings into the course.

School Impact on Facilitator and Student Roles and Performance

The local schools in this study had a critical effect on facilitator and student roles and performance in a number of ways. The high school calendar, including student and teacher holidays, and special events scheduling such as pep rallies and assemblies, affected how frequently students missed regularly scheduled distance education classes. This, in turn, affected facilitator roles in terms of logistically planning for students to make up missed coursework. In some cases, the facilitator role might be limited to taping the programs and making them available to students; in

others cases it meant showing them during later class periods; and occasionally a facilitator had to plan special make-up periods outside the regular class time. Ultimately, student performance was affected by when, and if, classes were made up. This was particularly evident at South High School where a number of school holidays did not coincide with the distance education schedule, and where a number of special activities disrupted class during the fall. In addition, over half the class at South High School missed class once a week for an entire semester as a result of the special calendar for Court Procedures. As Mrs. Grant, the South High School facilitator noted

> *If they don't get it at the beginning, if they miss it and don't make it up, and then they get lost, it's a wipeout. They never catch up.*
>
> (Mrs. Grant, South High School, Interview, May 15, 1995)

Thus, the school calendar had an indirect, adverse effect on student learning in the Physics course if the calendar resulted in students missing classes to the degree they got behind and couldn't (or didn't) catch up.

The school bell schedule also influenced student and facilitator activities. At North High School, a German class was scheduled at 9:00 a.m., just as the off-air Physics time was beginning. As a result, Physics students went to the media center for the off-air segment and the facilitator was not available to them during this time. This meant Mrs. Wilson could not participate in off-air activities with the students, and she felt this was detrimental to student learning. During previous years, she had used the off-air time to encourage students to call and ask the Physics teacher questions they did not understand, or had encouraged them to do homework together as a group on the board. These activities allowed students who were having difficulty to get help, either from the Physics teacher over the phone, or from the other students in the class (Mrs. Wilson, North High School, Interview, February 17, 1995). However, the 1994-1995 North High Physics students were reluctant to call the Physics teacher, unless Mrs. Wilson encouraged them and actually placed the call; and due to the school scheduling of the 9:00 German class she was rarely able to do this. In addition, cooperative learning through mutual homework review rarely occurred because students spent the off-air time in the media center visiting with each other rather than doing homework. In addition, students could not complete lab or other activities that required access to equipment while they were in the media center. At South High School, the bell schedule split the off-air period into two short segments that tended to be wasted by the students, unless they were under the direct supervision of the facilitator. And, as will be discussed shortly, the South High facilitator was not always able to be in the classroom.

School registration procedures had a major impact on North High School students in terms of pre-requisite skills. The Physics course required Algebra I and II as pre-requisites, and a number of students at North High School did not meet these requirements due to a registration problem. As a result, most of the North High School students had inadequate math skills and they were frequently unable to perform the algebraic procedures required in Physics. Consequently, their acquisition of Physics skills suffered. While the facilitator was not aware of this problem prior to the beginning of the course, she became aware of the Algebra deficiencies early in the course, but had no way of providing remediation.

Prior school experiences also affected Physics students. School degree requirements were a factor in all but three of the students' decisions to take Physics. In addition, almost all the North High School students had specifically chosen Physics because they had heard, from other students or the Chemistry teacher, that Physics was easier than the alternative Chemistry course. So, their expectations were that the course and the work required of them would be easy. While a number of the students at South High School perceived that Physics was a more difficult science, the amount and kind of work they were used to putting into courses did not prepare them for the effort required by the distance education Physics course. Many lacked the study skills and discipline required to succeed in Physics. Mrs. Grant, the facilitator, observed

> *I think this class requires more from them than they've been used to. They need to look at Physics every night, and they just did not do it. And that's where their problems come in.*
>
> (Mrs. Grant, South High School, Interview, May 15, 1995)

And while all but one South High School student met the Algebra pre-requisites on paper, most believed that the skills they had acquired in their previous math courses at South High did not adequately prepare them for Physics.

School grading scales nominally affected students in terms of their transcript records for Physics. For instance, the two South High School students whose course grade was an 83 or C would have earned a B at Central and North High Schools, while the South student with a 69 or D would have failed at Central and North. School drop policies for distance education courses also affected some students. None of the three schools allowed students to drop distance education courses after tuition had been paid to the course provider. But, several students at South and North High Schools indicated they would have dropped the course had that been an option, since they were doing so poorly in it. The drop policy may have indirectly contributed to the South High facilitator's test retake policy and the North High facilitator's policy of accepting homework after it was due. Both these policies provided an opportunity for students to improve their grades although they probably did not result in increased mastery of Physics concepts. However, the South and North High facilitators tried to do whatever they could to help students pass the course since they could not drop it (Mrs. Grant, South High School, Interview, May 15, 1995; Mrs. Wilson, North High School, Conversation, June 9, 1995).

Finally, other school responsibilities affected the amount of time the South High facilitator actually spent in the classroom. Mrs. Grant was a full-time school administrator, and she was occasionally called out of the Physics course to attend to other responsibilities. As a result, she periodically missed entire classes for several days or a week due to meetings, workshops, or other school obligations. Missing classes meant she had to catch up on what had been covered in Physics, determine what students had done or not done, and determine whether and how students would make up activities such as labs or quizzes they had not done while she was out. Since Mrs. Grant was an administrator, not a teacher, substitutes were not hired to take her place as facilitator. Furthermore, South High students indicated they did not stay on task and found it difficult to pay attention when Mrs. Grant was away or out of the room, so the regular learning process was always affected when she was absent.

Simply put, one of the major roles assumed by facilitators at all three schools was matching the features and requirements of the distance education course to the local school and students. This might mean the facilitators scheduled make-up sessions or made other arrangements to compensate for calendar deviations; made arrangements to extend due dates to accommodate lack of off-air class time during which labs would normally have been completed; determined when labs, quizzes or other assignments would be dropped rather than made-up, or established local homework or test administration policies. Generally, if the school closely matched the operational characteristics and suggestions outlined in the course design, the facilitator had to assume fewer of these alignment and mediation roles and responsibilities.

School climate and student expectations derived from prior school experiences directly affected student attitudes toward the course; particularly why they chose to take the course and how difficult they thought it was. In addition, the quality of the pre-requisite skills students brought with them from prior classes contributed to their subsequent ability or failure to master physics concepts. School calendars and schedules directly affected how students were able to participate in the class.

Facilitator Roles and Their Effect on Student Performance

Facilitators at all three schools engaged in planning, instructional, management and climate roles, although all agreed that their primary focus was on classroom management and climate. The specific nature of the planning, instructional, management and climate roles depended on facilitator backgrounds, student needs, and, to some extent, school constraints.

While the responsibility for instructional planning and delivery was entirely left up to the Physics teacher, the facilitators were responsible for logistical planning and implementation. All three facilitators duplicated instructional materials developed by the Physics teacher and distributed them to the students. They also maintained lab equipment and prepared the classrooms for lab activities. And, as discussed in the previous section, they made plans to accommodate for deviations between the school calendar and schedule and the Physics course calendar and schedule. The Physics teacher delivered most of the instructional events, but occasionally the facilitators provided supplemental instructional guidance or feedback as they responded to student questions. The South and North High School facilitators, Mrs. Grant and Mrs. Wilson, occasionally answered informational questions directly, but more frequently directed students to other resources such as other students, teachers, the Physics teacher, the Homework Hotline, or the telephone tutors. Since she had a Science background, Mrs. Sanders, the Central High School facilitator, was able to answer student questions personally. In addition, Mrs. Grant and Mrs. Wilson played a major role in gaining (and maintaining) student attention during class and in eliciting student performance during labs and other in-class activities. Because the Central High School students tended to stay on task, paying attention and participating independently, Mrs. Sanders rarely had to assume these roles. All three facilitators implemented the testing and student assessment activities planned by the Physics teacher. However, each facilitator instituted grading policies and procedures that they thought were appropriate for their students and instructional setting. For instance, Mrs. Grant allowed students to retake tests for extra credit and Mrs. Wilson allowed students to turn in homework long after it was due.

Mrs. Grant, Mrs. Sanders and Mrs. Wilson all assumed classroom management and climate roles, although Mrs. Grant and Mrs. Wilson played more active roles than that required of Mrs. Sanders. Mrs. Sanders reported, and classroom observation confirmed, that Central High students were mature and required little supervision, while Mrs. Grant and Mrs. Wilson were continuously working to keep South and North High School students on task, paying attention, behaving appropriately and participating in classroom activities. At South High School, Mrs. Grant played a major role in gaining and keeping student's attention and tried to motivate them to participate in class. She always coached or guided students through labs, since students tended to sit idly without her direct intervention. The students confirmed these observations and reported that it was difficulty to pay attention in Physics, particularly when the facilitator was absent. At North High School, Mrs. Wilson sat among the students to keep them on task, and frequently interrupted student conversations or other off-task behaviors to get students to focus on what the Physics teacher was covering. Students at North High indicated that they found it hard to focus and pay attention and relied on the facilitator to keep them on task. Some complained that other students' tendencies to talk during class made it difficult to concentrate. Both Mrs. Wilson and the students indicated the class stayed on task better when she was in the room, and classroom observation supported this. All three facilitators assumed classroom climate roles, displaying positive attitudes toward the course and instructor, encouraging positive student attitudes and trying to build supporting relationships with and among the students. The South and North High School facilitators also tried to work with other teachers in the school to make them aware of special needs or dispensations the Physics students required as a result of their participation in the distance ed course. In all three schools, facilitators maintained indirect contact with parents through mid-term grading period progress reports and this was an extended facet of classroom climate. Mrs. Wilson also maintained direct personal contact with several parents who were concerned about their child's

performance in Physics.

In summary, while all three facilitators played planning, instructional, management and climate roles to some degree, the amount of facilitator responsibility in each area was affected by the distance education course itself, the local school factors, student characteristics and behavior, and to some extent, facilitator background. Because the distance education course design did not require facilitators to play an instructional role, the facilitators did not assume many instructional roles. However, because the students at South and North High School tended to be less motivated, the facilitators at those schools tended to play instructional and classroom management roles more frequently, particularly in the areas of gaining and maintaining attention and eliciting student performance. And, even though the Physics teacher planned and delivered the instructional components; local school calendars and special activities schedules meant students at South and North High School missed some of the regularly scheduled classroom sessions. As a result, the facilitators at those schools tried to make logistical arrangements for students to make up those classes. Consequently, school factors and student needs played an important part in determining the roles facilitators played in the classroom, and the frequency with which they assumed those roles.

Facilitator effect on students' affective, cognitive, and behavioral performance also varied according to individual student characteristics. Students at all three schools reported that the facilitators consistently affected student attitudes and motivation by their positive and enthusiastic classroom behavior. The impact of the facilitator in maintaining good student attitudes was most apparent at North High School where students were positive about the distance education course, even though they lacked adequate mathematical preparation and were struggling to pass. While students at South and North High School indicated that the facilitator had little impact on cognitive performance, the Central High students indicated that their facilitator, Mrs. Sanders, did affect their cognitive performance because she was able to answer questions they could not figure out independently. However, the Central High students noted they rarely had to rely on Mrs. Sanders expertise. Observations at North High School the previous year revealed that Mrs. Wilson indirectly affected students cognitive performance by supervising homework discussions and boardwork among class members, and by helping students contact and discuss problems with the Physics teacher by telephone during the off-air period. However, school scheduling problems, specifically, the beginning of a distance education German class at the end of the Physics broadcast, precluded this type of facilitator support at North High School during the 1994-1995 school year. Finally, Central High students indicated their facilitator had little effect on their classroom behavior because they paid attention, stayed on task and participated in class activities regardless of whether Mrs. Sanders was in or out of the room. However, the students at South and North High Schools said their facilitators directly affected their classroom behavior and participation since they tended not to pay attention or engage in class activities if the facilitator was not monitoring them. And since other school responsibilities meant Mrs. Grant (South High School) was out of the classroom on occasion, this affected South High School students' behavioral performance in the classroom. So, while facilitators affected student performance, school factors affected facilitator roles, and subsequently the impact of the facilitator on student performance.

Other Factors that Affected Facilitator and Student Roles and Performance

Students' cognitive, affective, and behavioral characteristics had an effect on both student and facilitator roles and performance in the Physics class. As previously discussed, students' mastery of the pre-requisite math skills had a direct effect on their Physics performance. Cognitively, they could not master new Physics concepts without the supporting math skills. The math deficiency indirectly affected the attitudes of North High School Physics students such as Paul and Linda who felt there was no way they could be successful without the math skills (Paul,

North High School, Interview, February 15, 1995; Linda, North High School, Interview, February 6, 1995).

Individual student aptitudes and other academic skills and experiences also affected the Physics students and facilitators. At Central High School, many of the students had taken Physics because they were interested in the subject. Mrs. Sanders observed that most of these students were gifted, and that all had a great deal of initiative and self-responsibility.

> *They're very motivated, very motivated. Most of them are relatively competitive with one another in that class. Not all of them, but they'll argue over fine points of reasoning with each other, and they worry about who made what. They've very much individuals, but they do work well together. They form their own groups for themselves, that's their decision, who works with who. And they do take care of each other. They make sure no one's alone. I think that really, it's this particular mix of students.*
>
> (Mrs. Sanders, Central High School, Interview, February 22, 1995)

The Central students stayed focused and attentive during class, rarely had trouble grasping concepts, and found the pacing of the Physics class to be satisfactory. They had good study habits, recognized the importance of solving homework problems rather than copying answers, and had good test-taking skills. They also took responsibility for making up classes they missed by taking tapes home or viewing them before or after school. Consequently, their academic performance was good, and Mrs. Sanders rarely had to intervene or provide direct support for class activities.

This contrasted with the students at South and North High Schools, most of whom were average students with average academic backgrounds. They had more difficulty staying on task and paying attention, inadequately utilized some of the instructional resources such as the Physics Companion, occasionally found the pacing of the course too fast, frequently copied homework answers just to get credit, and employed educated guess strategies when taking tests. They tended to accept less responsibility for their own learning, relying on the facilitator to help them focus or to make sure they did their homework or labs. While some of the students at North High School reviewed tapes for classes they missed, only one South High student routinely made up missed classes without direct facilitator intervention. Facilitators at these two schools provided a great deal of support and guidance during class to help students to pay attention and participate in class activities, to actively help them complete assignments such as labs, to make sure they turned in homework, and to encourage students to utilize supporting outside resources such as the tutors. While some of the South and North High students performed satisfactorily on tests suggesting that they had mastered Physics skills covered in class, a number of students at these schools relied on homework credit and good lab scores to pass the course.

Facilitator backgrounds also contributed to facilitator roles. Since Mrs. Sanders had a science degree, she could usually provide immediate answers to any content-related questions students might have. While Mrs. Grant or Mrs. Wilson might be able to answer some Physics questions -- based on things they had learned in previous years -- their more frequent information/feedback role was to direct and encourage students to use other resources to find answers. Some of the South and North High students indicated that they called the tutors and found them helpful, but many were reluctant to call or found it difficult to communicate with the tutors. And, since a student's ability to clarify and resolve conceptual or procedural questions ultimately affects student learning, the Central High students' Physics performance was influenced to some degree by Mrs. Sanders ability to answer their (infrequent) questions. Of course, as has been previously observed, Central High students also turned to each other for help. At South and North High Schools, the students had frequent questions; and whether Mrs. Grant or Mrs. Wilson could answer the questions, or direct them to an alternative information source (and get the students

to use the resource), affected student learning. Unfortunately, the South and North High School students rarely took advantage of these resources.

Hersey and Blanchard (1988) developed a situational leadership model that provides an additional framework for interpreting facilitator and student roles and behavior in high school distance education. The situational leadership model suggests that leadership roles and behavior depend on follower readiness. Readiness levels are assessed on two dimensions, ability (knowledge, experience, skill) and willingness (confidence, commitment, motivation). Followers with low ability and willingness require leaders to actively guide and direct; followers with medium levels require clarification, encouragement and collaboration; and followers with high ability and willingness function effectively with minimal observation and monitoring. In the distance education setting, this suggests that when students have strong ability in terms of prior and current knowledge, experience and skill; and are willing, committed and motivated to take personal responsibility for the work required by the distance education class; the facilitator can assume a low profile role. That is, facilitators working with students of high ability and willingness must occasionally clarify questions and provide a positive classroom climate, but their primary role is administrative -- serving as a classroom monitor and observer who rarely intervenes in class activities. Central High School was an illustration of this case; the students were gifted with strong academic skills and the personal interest, initiative and motivation to participate actively in the Physics. The students in the Physics courses at South and North High school were at lower points on the ability and willingness continuum. Some of the students had inadequate skills, particularly in mathematics, and while some were willing to assume responsibility for their own learning, many expected an external teacher or facilitator to make sure that they did their work. Others lacked confidence, particularly when it came to seeking help from outside resources such as the tutors. In these schools the facilitators played more active roles, guiding and directing students to pay attention, do labs, and turn in their homework, as well as encouraging them to participate in class activities and to call the Physics teacher or the tutors for help.

Instructional Systems Design and Distance Education

The discussion to this point has reviewed the interrelationships between the student, facilitator, and local high school components in terms of student and facilitator roles and performance. This section will examine the components of the distance education system from an instructional systems design perspective, using the generic ADDIE (Analyze, Design, Develop, Implement, Evaluate) design model.

Theoretically, the analysis phase of the generic design model incorporates an analysis of learner needs, characteristics, and an instructional analysis. From these analyses, instructional goals and objectives are formulated and entry skills are identified. A course, or other intervention, is then designed, based on the results of the analysis phase. During the course design, specific performance objectives and assessments are identified and instructional strategies are planned to support the targeted objectives. Activities are designed and then developed or selected to provide students with the events of instruction (Gagné, 1985). These include gaining attention, informing students of the objectives, reviewing pre-requisite skills, presenting new information, providing learning guidance, eliciting student performance, providing feedback, assessing student performance, and enhancing student retention and transfer. The instructional system is then implemented, and formative and summative evaluation is conducted to determine what objectives students mastered, what skills were not mastered and why, and what course revisions should be made.

The analysis, design and development phases for distance education courses are all conducted by the course designer (in this case, the Physics teacher). While the instructional design model suggests that the learner analysis identifies skills, knowledge, abilities, and attitudes of the target population, and states that course design is draws on these common skills and traits; the

model also provides for the design and development of supplemental or complementary instructional components for those students who don't match the general population characteristics. However, in distance education, the instructor/designer may not have direct access to the students and may not be aware of instances where students do not have the skills, knowledge, abilities and attitudes that were initially considered to be entry or pre-requisite skills. The designer/instructor can identify the entry skills of the target population, but the implementing schools must assure that students have these pre-requisite skills. In this study, despite the fact that Algebra II had been identified as a pre-requisite, many students at North High School had not completed this course. While most students at South High School had completed Algebra II, many indicated they had not mastered the required Algebra II skills. In a regular classroom, the teacher could have adjusted instruction accordingly, but in this satellite-delivered context, such accommodation was not possible. The instructor, operating in a distance education setting with large numbers of students scattered among many sites, does not have the diagnostic resources or interactive capabilities to identify and remediate inadequate entry skills once the course is underway. The responsibility for this diagnosis and remediation must reside at the local school level. However, the designer/instructor could develop a screening instrument that local schools could administer prior to allowing students to enroll in a class. A screening instrument, rather than pre-requisite courses, might alleviate some of the entry skill deficiency difficulties some students in this study experienced.

After the analysis, design, and development stages, the implementation stage begins. This is a joint effort between the course provider and the local students, facilitators, and high schools. The course provider and course instructor deliver the course as designed, but the local schools, facilitators and students may utilize it in different configurations depending on local circumstances. In this study, Central High School, the school where the Physics program was most successful (as indicated by student course grades), utilized the course almost exactly as designed. At Central, the school bell-schedule matched the course bell schedule almost identically, and a 15-20 minute off-air period followed the broadcast class as suggested by the course provider. This schedule, coupled with few school holidays beyond those observed by the course provider, meant that students experienced the full range of instructional activities developed by the instructor/designer, and meant that they participated in those activities in the appropriate sequence. At South High School, the school bell schedule broke the off-air period into two short segments before and after the broadcast, and at North High School, students had to move to the media center for the off-air segment since a German distance education class was scheduled immediately following the Physics broadcast. These complications meant that students were rarely able to complete off-air activities and labs as intended by the course provider. In addition, special school activities, teacher work days, and student holidays caused students at these two schools to periodically miss classes, and they rarely made the classes up. This destroyed the instructional sequencing planned by the Physics instructor and contributed to inadequate student mastery of objectives. So, while the course provider delivers instruction in distance education, the local school organization must assure that the instruction is implemented in an instructionally sound manner. If the school can not implement the course exactly as designed, it must make alternate provisions to assure students can participate fully in all designed instructional activities and engage in them in the proper sequence.

Within the implementation phase, one can also examine the implementation of the nine instructional events. While the Physics teacher could include interesting, relevant activities designed to build student confidence and satisfaction, the limited interaction between the teacher and students precluded the Physics teacher from being able to ascertain if attention had actually been gained. Ultimately, the facilitator had to determine if students were attending to the instruction, and, if they were not, facilitators had to direct student attention to the task at hand. Thus, the responsibility for the first instructional event was shared by the Physics teacher and facilitator. And, as noted by the students at South and North High Schools, they frequently did not pay attention if the facilitator was out of the room. This was a particular problem at South High

School where the facilitator had to leave the room periodically to take care of other responsibilities.

The second, third, fourth and fifth instructional events; informing students of the objectives, reviewing pre-requisites, presenting new information, and providing learning guidance; were all implemented by the Physics teacher. However, the third event, the review of pre-requisite skills, includes some of the same problems previously identified in the discussion of entry skills. The distant teacher may not have the time or logistical ability to determine if the pre-requisite skills have been adequately reviewed. Thus, the local facilitator may have to assume some of the responsibility for assessing whether these skills have been adequately recalled and mastered. If the facilitator has subject area expertise, he or she may be able to ascertain this and provide appropriate remediation without support from the Physics teacher. However, if the facilitator does not have subject area expertise, the course designer/teacher must provide an instructional instrument for the facilitators to use at the outset of each unit to determine if pre-requisite unit skills have been mastered, and a supplementary activity to provide additional review in case they have not. These could be implemented during off-air class periods that surround the actual class broadcast.

The Physics teacher provided instructional activities that addressed the sixth and seventh events of instruction, eliciting student performance and providing feedback. During class broadcasts, keypad questions and follow-up discussions were included to elicit student performance and provide feedback. In addition, off-air class activities and labs also provided students with the opportunity to practice emerging skills. However, at South and North High Schools, students tended not to participate in the in-class activities unless Mrs. Grant and Mrs. Wilson encouraged or reminded them to use their keypads to respond to the teacher's questions. Along the same lines, the facilitators at these two schools had to consistently prompt students to complete other off-air activities and labs. Accordingly, student participation in these activities diminished if the facilitator was out of the classroom. This was not the case at Central High School where students participated independently in all activities, regardless of facilitator presence. Additional feedback was available to students through the Homework Hotline and telephone tutors. However, the students who complained about not being able to get feedback or support and help with problems (primarily the South and North High School students), were reluctant to use these resources. Occasionally the facilitator at North High School was successful at encouraging students to use the supplemental resources at the end of class, but she was rarely able to undertake the supplemental resource scaffolding due to class scheduling. The students at Central High School felt they received adequate feedback since their facilitator had a science background and could answer any questions they raised. So, while the Physics teacher provided instructional activities that elicited student performance and provided feedback and instructional support, this did not guarantee students engaged in the instructional events. Frequently, facilitator encouragement was required to assure that students participated in these activities.

The last two instructional events, student assessment and enhancement of transfer and retention, were also designed, developed, and initially presented by the Physics teacher; but actual implementation of assessment was supervised by the local facilitator. And, as reported in the descriptive findings, implementation varied between schools according to how each facilitator chose to administer and score tests and other assignments. These variations occurred in spite of test administration and scoring guidelines provided by the Physics teacher. Further, appropriate interpretation of assessment results requires an awareness of how the tests were administered and scored, as well as recognition of test taking strategies students employed. That is, did students get to retake tests for additional credit? Did they actually work problems out on tests or employ a best guess strategy? Did they do homework problems independently or copy them from the book or another student? And since the Physics teacher was usually unaware of these facilitator and student test adaptations, his review of test scores might suggest student mastery of objectives that had not actually occurred. Again, while evaluation and assessment activities are planned and developed by the instructor/designer, the instructional value of the assessment is not fully realized unless appropriately implemented at the local level.

Finally, the evaluation phase of the instructional design process requires that the course designer revise instruction based on student performance data. If the performance data collected through the assessment designed by the instructor and implemented by the facilitators is not reliable and valid, inappropriate course revision may occur. And, as previously described, assessments in this study were frequently administered in different ways, according to the characteristics of the local students and the strategies local facilitators thought appropriate. So, revisions that a course instructor/designer might choose to make, based on student test scores reported by a facilitator, could be inappropriate unless the designer was aware of the deviations that occurred at the local level during student assessment and evaluation.

The discussion in this section underscores the interrelationships and interdependencies that exist between the various components of a distant education system; in this case, the course provider and Physics teacher, local high schools, facilitators, and students. This interdependence exists at both the macro course design level and the micro lesson planning/instructional events and implementation levels. It also emphasizes the importance of the local schools and facilitators at the implementation stage of the design model. Failure to recognize the importance and contribution of each component at the various stages of the system model can result in an inadequate learning experience for the student and subsequent failure to master instructional objectives. It can also defeat the instructional design process, particularly if one component in the system provides inadequate or incomplete data to another component in the system.

Implications for Theory and Practice

This study supports the position of theorists such as Shale (1990), Garrison (1989), and Smith and Kelly (1987) who contend that distance education, while morphologically different, does not constitute a distinct educational process. The same factors that affect student learning in a traditional classroom also affect student learning in a high school distance education class; that is, learner skills, knowledge, beliefs, and attitudes, and course and lesson design.

The study also suggests that responsibility for the quality and outcome of high school distance education courses is shared among all components of the distance education system; the course provider, including the teacher and designers, the high school utilizing the program, and the local facilitators and students who are participating in the course. Specifically, the course provider, instructor, and designers, are responsible for providing effective, efficient instruction in the form of courses that maximize student achievement. This includes designing, developing and providing instruction, materials and activities, that, when utilized as prescribed, result in student mastery of clearly defined objectives. This also includes clear specification of desired student outcomes, required student entry skills (perhaps a specific pre-requisite skills test rather than designation of required pre-requisite courses for which student exit competencies can vary from school to school), instructional materials and activities, a prescribed plan for course implementation, and other student support as required.

The responsibilities of the local school include assuring students possess the pre-requisite entry skills, and supporting utilization of the course as designed by the course provider. This includes fully implementing the complete range of instructional activities in the sequence designed by the course provider. Or, if the school can not implement the course exactly as designed, it must assure that other components in the system can compensate for the instructional elements that were not implemented as designed. Specific school responsibilities include registering (and pre-screening) students, establishing school calendars, bell schedules, and selecting and establishing facilitator availability. These are all factors which contribute, directly or indirectly, to facilitator and student roles and performance. Since two of the schools participating in this study deviated to some degree from the course provider's implementation recommendations (i.e., student pre-requisites, off-air activity block scheduling, and facilitator availability), this may provide evidence that one of the challenges high school distance education course providers will face is getting

schools to utilize courses as designed. This is similar to the problems instructional designers have traditionally faced in getting schools to use courseware as designed (Burkman, 1987).

Finally, the study suggests that in addition to course design and school factors, facilitator roles and performance requirements will be defined by the needs of the students themselves. Students who are high on the motivation and willingness continuum but low on the ability continuum may require facilitator support in the form of instructional assistance (if the facilitator has subject area expertise) or encouragement and assistance in using telephone tutor or other external support (if the facilitator does not have content area expertise); whereas students who are high on ability but low on motivation and willingness will require facilitator support to help them stay on task and participate in class activities.

A major concern raised by this study is the inability or unwillingness of students to use outside resources such as the tutors. If facilitators do not have subject-area expertise, access to and use of these external resources is critical for students who are having difficulty in the course. Some students indicated they had problems communicating questions to the tutors, or conceptualizing the answers tutors gave them. Others were just unwilling or afraid to talk to someone they didn't know, either out of shyness or a fear of looking stupid. In either case, course designers might consider strategies for helping students overcome these obstacles, either by working directly with students, or in conjunction with facilitators. Facilitator training in how to encourage and help students learn to use the external resources, in conjunction with other strategies employed by the course instructor/designer to help students overcome their reluctance to use external resources, should help increase utilization of supplementary instructional support resources.

Recommendations for Future Research

This study was designed as an exploratory study to investigate facilitator and student roles and performance in high school distance education courses. By design, it focused on one high school distance education course, and was limited to three cases. Follow-up studies should be done to determine if the findings from this study generalize to other high school distance education courses in different content areas, courses that employ different designs, or courses that use delivery systems with different attributes (for instance, two way audio and video that permits continual interaction between remote teacher and local classrooms). Additional studies could also investigate different pairings of facilitator and student groups; for instance, looking at facilitator and student roles and performance when facilitators with no content area expertise work with students who are high on the ability and willingness continuum; or looking at roles and performance when facilitators with content area expertise work with students who are low on the ability and willingness continuum.

Research should also be conducted to identify effective strategies to help students overcome their inability or unwillingness to utilize non-familiar, or non-classroom resources. This might include research on cognitive and affective instruction or activities that can help students learn to make better use of resources such as the broadcast tape, supporting print resources, the Homework Hotline or the telephone tutors.

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